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Risk Study – Phase III

Status Report for
Colorado River District
Board of Directors
April 16, 2019

Phase III Scope of work

- Current and Future Conditions Modeling in Both CRSS and StateMod
 - Current = 2018 Demand schedule from UCRC (CRSS); StateMod's baseline
 - Future Demands = Define first for StateMod, then synchronize with CRSS
- Investigate StateMod behavior with respect to admin and adjudication dates:
 - Uncertainty about "pre" vs "post" compact water volumes
 - Within and across west-slope basins
 - Using several different administration dates
- Evaluate Different Curtailment Scenarios in StateMod:
 - Volumes by basin
 - Volumes by west slope / TBD pro-rata (split by basin or as a whole)
- Evaluate a 500KAF Upper Basin Water Bank (ala the DCP)
 - At Powell with 50kaf and 100kaf annual contributions.
 - To protect against Compact Deficit.

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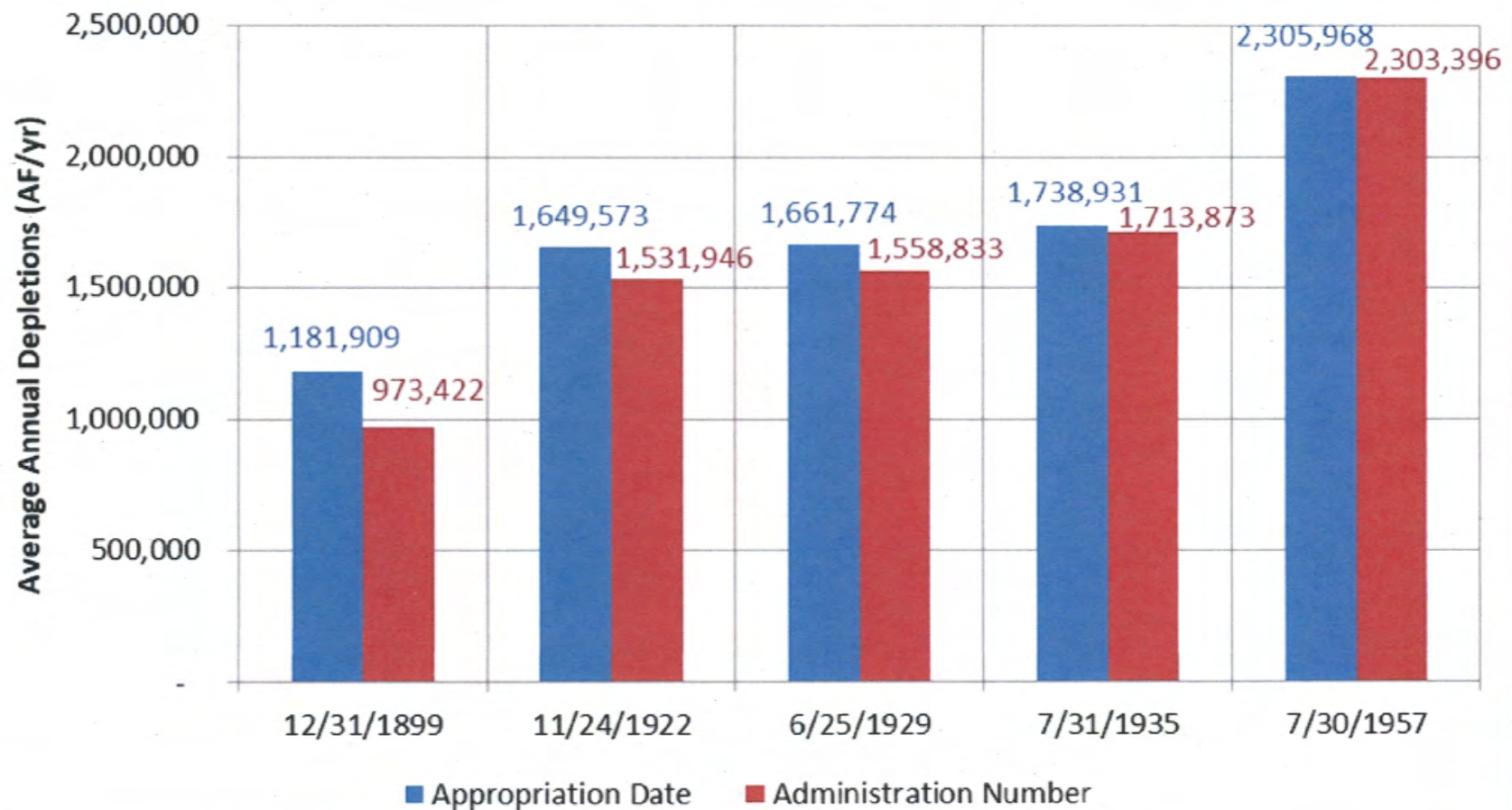
How Much Consumptive Use is Senior to Key Dates in Development of Colorado Water?

Modeled Administration dates:

- (12/31/1899) turn of the Twentieth Century (as a “bookend”)
- (11/24/1922) the signing of the Colorado River Compact
- (6/25/1929) the signing of the Boulder Canyon Project Act
- (7/31/1935) one day prior to the Colorado-Big Thompson Project Senior administration date
- (7/30/1957) the day after the Fryingpan-Arkansas Project administration date

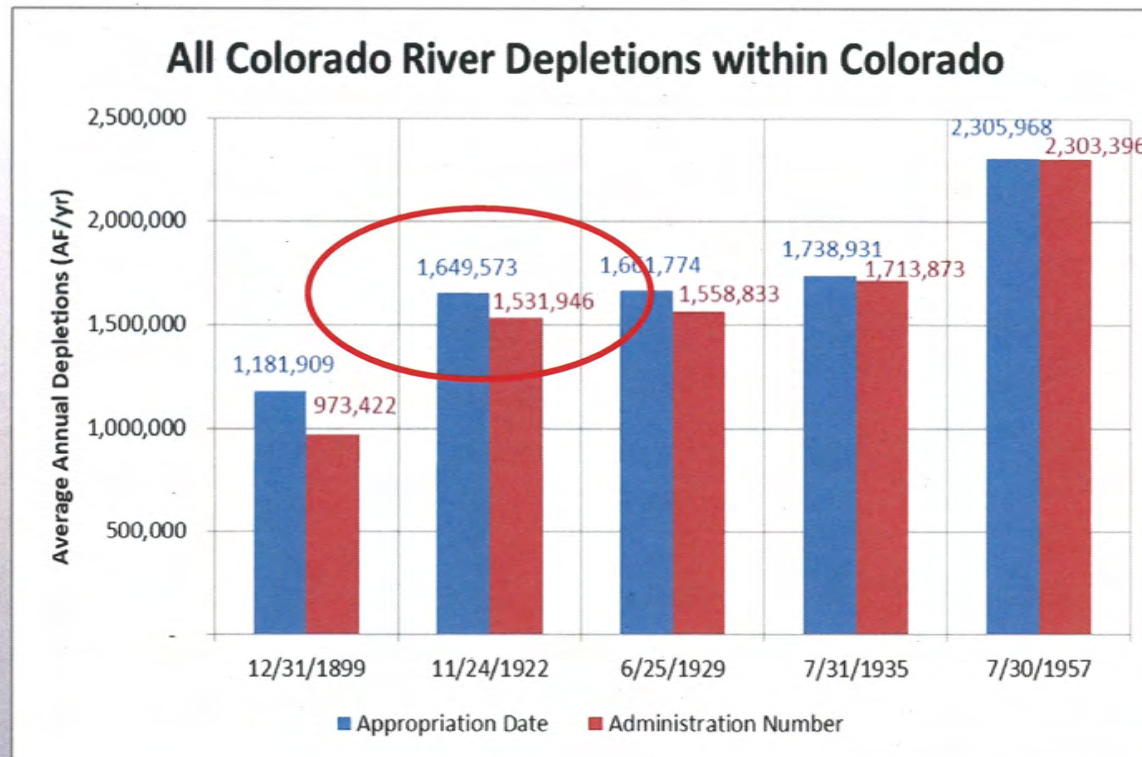
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All Colorado River Depletions within Colorado



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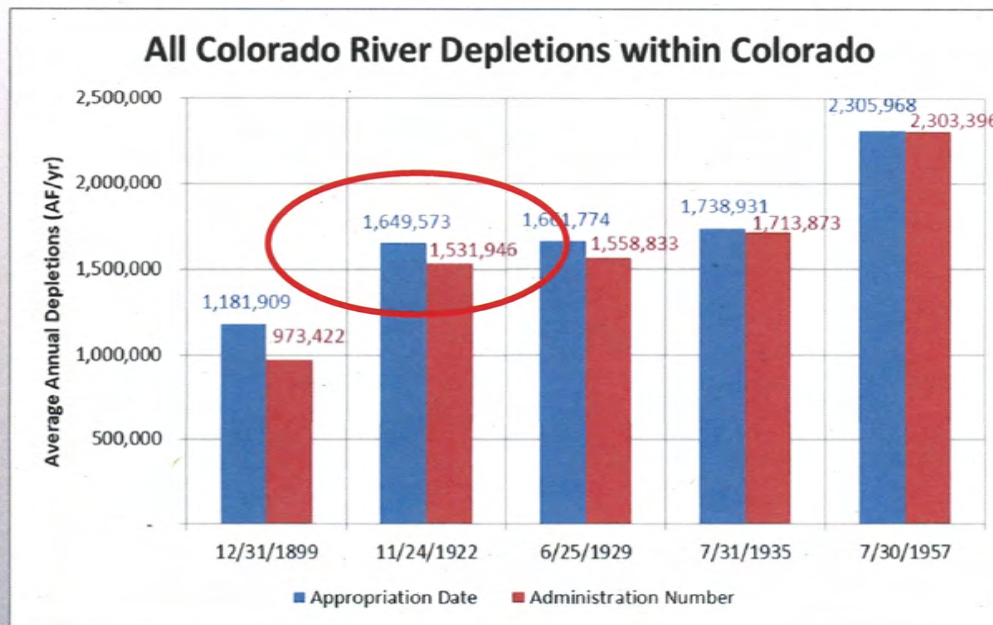
- Note the simulated pre-compact consumptive use numbers
- higher than we expected (conventional wisdom based on Historical usage suggests ~1.1-1.2 MAF)



Why?

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- Increased irrigation efficiency if only using pre-1922 rights
 - Typically there is water available for both SR and JR rights, so modeled efficiency is lower (this is also reflected in actual usage data)
- Better methodologies for determining Crop CU over time
 - Modified B-C including High-Alt adjustments lead to higher CU than previously computed



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Digging into the details of the Statemod model

- Baseline individual basin StateMod vs CRSS
- Baseline linked StateMod vs Baseline individual basin StateMod
- Baseline linked StateMod vs Future Use

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Individual Basin StateMod / CRSS Comparison

- StateMod and CRSS results from 1988-2005 (current period of overlap when using the "Stress Test" hydrology)

CRSS

CRSS-BL (current)	Annual Depletions (AF/yr)		
	Minimum	Average	Maximum
Yampa	169,151	193,879	209,249
White	22,884	36,624	48,310
Upper Colorado & Front Range	684,794	1,227,709	1,294,957
Gunnison	269,198	501,108	532,688
San Juan & Dolores	224,687	410,644	438,421
StateWide	1,370,713	2,369,965	2,523,625

StateMod

StateMod Individual (current)	Annual Depletions (AF/yr)		
	Minimum	Average	Maximum
Yampa	173,547	196,982	215,193
White	48,550	62,060	69,030
Upper Colorado & Front Range	1,117,487	1,220,386	1,345,192
Gunnison	502,591	575,267	624,538
San Juan & Dolores	335,365	500,717	556,627
StateWide	2,258,518	2,555,413	2,743,484

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Linked StateMod vs Individual Basin StateMod Results

- 1988-2005
- Average Depletions Are Similar (~ 1% Diff)
- Upper Colorado model from CRWAS, not 2015 update

Individual Basin Models

Individual Model Basin	Average CU (AF/yr)	Average Evap (AF/yr)	Average Loss (AF/yr)	Average Depletions (AF/yr)
Yampa	170,538	12,870	13,573	196,982
White	49,758	3,086	9,217	62,060
Colorado	1,117,645	48,414	54,327	1,220,386
Gunnison	487,856	37,715	49,697	575,267
San Juan	424,764	33,600	42,353	500,717
Total Individual	2,250,560	135,685	169,167	2,555,413

Linked Model

Linked Model Basin	Average CU (AF/yr)	Average Evap (AF/yr)	Average Loss (AF/yr)	Average Depletions (AF/yr)
Yampa	169,354	11,383	13,147	193,884
White	49,750	1,767	9,216	60,733
Colorado	1,108,453	45,157	52,867	1,206,476
Gunnison	489,354	34,674	49,241	573,269
San Juan	417,240	29,747	42,776	489,763
Total Linked	2,234,151	122,728	167,246	2,524,125

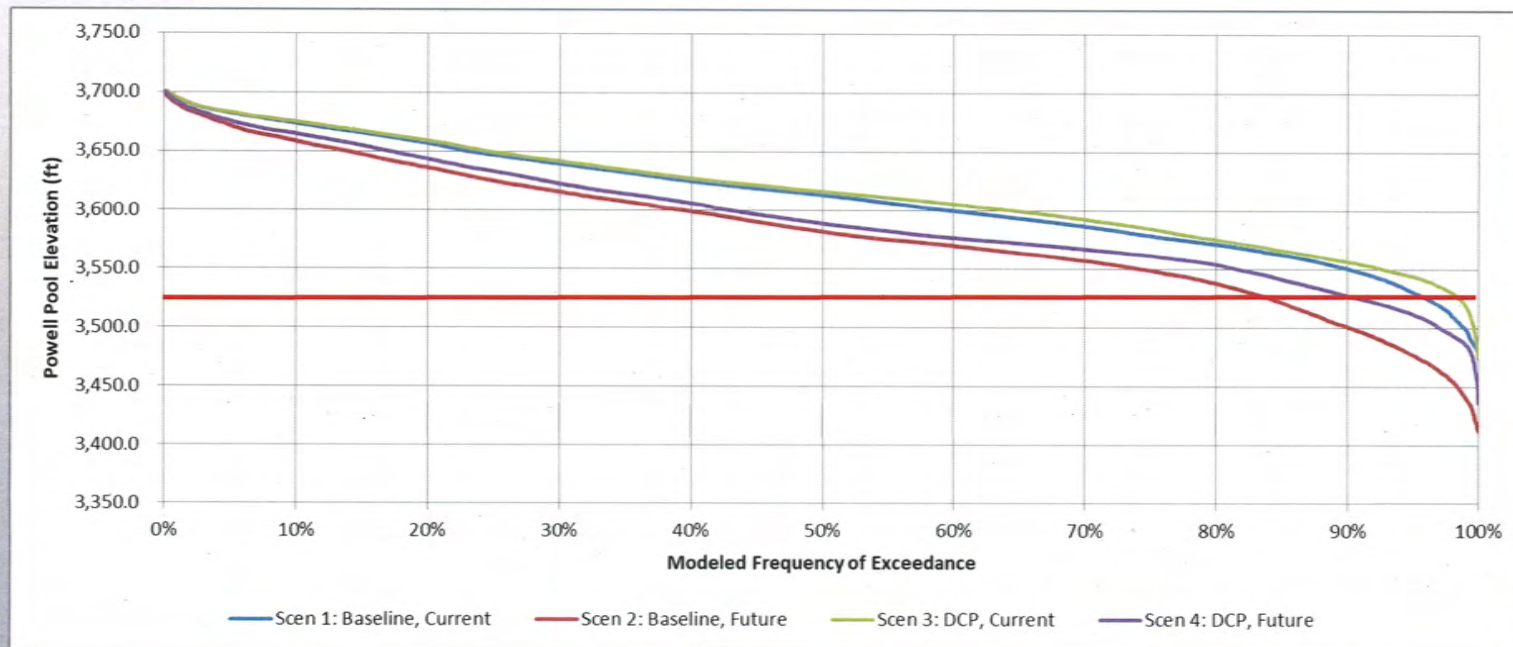
StateMod Future Uses

- Future Uses identified through conversations with BRT reps on the Technical Working Group
- Shortages are apparent both to new uses as well as some junior existing uses (Especially on the Colorado mainstem)
- Equivalent increases used for other Upper Basin states in CRSS (equivalent to approximately 2040 in the 2017 UCRC Demand Schedule)

StateMod Linked Model	Future Use Depletions (AF/yr)		
	Average Yield of New Depletions	Average Increase in Basin Depletions	Input Demand
Yampa	29,506	29,485	30,104
White	61,839	61,787	65,000
Upper Colorado & Front Range	86,077	82,425	120,450
Gunnison	31,053	31,100	37,900
Southwest	81,104	82,355	130,499
StateWide	289,578	287,153	383,953

Preliminary Results

- Simulating Lake Powell conditions with linked StateMod/CRSS model
- Baseline = 2019 / Current conditions demands
- Future = ~2040 (UT, WY, NM); New demands for StateMod (+384kaf)
- Stress Test (1988-2015) Hydrology



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What's Next?

- Continue To Look at Pre-Compact CU Estimates
- Simulate Different Call / Demand Management Scenarios in StateMod
- Simulate Stress Test in CRSS With Current StateMod Depletions
- Incorporate Future Depletions Into CRSS
- CRSS Simulations with Water Bank
- Paleohydrology Simulations
- Re-Evaluate Lake Powell Risk Profiles

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END